10/502011

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SCM 60497/WO	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/00011	International filing date *(day/month/year)* 06.01.2003	Priority date *(day/month/year)* 02.02.2002
International Patent Classification (IPC) or both national classification and IPC C08G85/00		
Applicant AVECIA LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
07.07.2003	13.04.2004
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer olde Scheper, B Telephone No. +49 89 2399-2141

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/00011

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-19 as originally filed

Claims, Numbers

1-13 received on 23.02.2004 with letter of 16.02.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: EP-A-0 743 345 (SCITEX DIGITAL PRINTING, INC.) 20 November 1996 (1996-11-20)
D2: WO 02 08301 A (MEMBRANA GMBH) 31 January 2002 (2002-01-31)
D3: US 2001/046824 A1 (A. NIGAM) 29 November 2001 (2001-11-29)
D4: US-A-4 559 058 (B. BENNETT) 17 December 1985 (1985-12-17)
D5: US-A-5 425 805 (R. BOTROS) 20 June 1995 (1995-06-20)
D6: US-A-4 666 519 (K. AKIYAMA) 19 May 1987 (1987-05-19)
D7: EP-A-0 566 270 (XEROX CORPORATION) 20 October 1993 (1993-10-20)
D8: EP-A-1 172 224 (NICCA CHEMICAL CO., LTD.) 16 January 2002 (2002-01-16)
D9: US-A-4 159 898 (C. COHEN) 3 July 1979 (1979-07-03)

1. It is to be noted that the feature "prepolymer" is used outside the normal context of the art. It is clear from the description (cf. page 2, line 21 to page 4, line 5) that monomers are encompassed by the claims on file. Moreover, if the indexes "m" and "n", used in formula (1), are 1 (one) then the resulting compound is a monomer.

   The International Union of Pure and Applied Chemistry (IUPAC) defines a prepolymer as a polymer or oligomer capable of entering, via reactive groups, into further polymerization; the reactive species thereby contributes more than one monomeric unit to at least one chain of the final polymer and an oligomer as a substance composed of molecules containing a few constitutional units repetitively linked to each other.

2. Document D1 discloses ethoxylated diphenyl guanidine. D1 does not disclose compounds of Formula (1). It appears that D1 does also not disclose "chain extending" but rather "capping" in that up to 80% of all available nitrogen atoms are "ethoxylated" by using epichlorohydrin (see page 2, lines 41-43; page 3, lines

17-19 and 38-40). Epichlorohydrin does not have two reactive groups as required by present claim 1. Finally, the obtained products can not be considered as polymers. The products are used in ink jet recording fluids and they are applied on a surface by an ink jet printing process.

Thus, the present application is not anticipated by D1.

3. Document D2 discloses a process in which diamine guanidinium or triamine guanidinium is reacted with a polymeric article (cf. claims 1-18; examples). This disclosure does neither disclose compounds of Formula (1), nor the chain extender which might lead to a polymer.

Thus, the present application is not anticipated by D2.

4. Document D3 discloses ink jet compositions comprising guanidine polymers or copolymers of an azetidinium monomeric unit and a guanidine monomeric unit. It appears from the disclosure that these polymers are formed but not chain extended. It does not appear from the disclosure that the binders used in the coating compositions react with the guanidine (co)polymers.

It appears therefore that D3 does not anticipate the subject matter of the claims on file.

5. Document D4 discloses the chain extending of guanidine or biguanidine, there use in dyes and printing processes (cf. claims 1-44; column 1, line 7 to column 5, line 10; examples 1-4). Disclosed are compounds having a C_2-C_4-alkylene group (see column 2, lines 1-2 and 9-10). Compounds having a C_6-alkylene groups as required by Formula (1) are not disclosed.

Thus, the present application is not anticipated by D4.

6. Document D5 discloses ethoxylated diphenyl guanidine. The products are used in ink jet recording fluids and they are applied on a surface by an ink jet printing process (cf. example 3; claims 1-26).

The present application is not anticipated by D5 for the same reasons as set out

for document D1 (see paragraph 2 above).

7. Document D6 discloses ink compositions based on an epoxy compound and an amine compound which can be selected from several guanidine compounds (cf. claims 1, 3, 10). None of the optional amine described by D6 (see column 7, lines 6-37) fall within the scope that is required to obtain the prepolymers according to Formula (1).

8. Document D7 appears to be less relevant.

9. Document D8 discloses a process in which a polyhexamethylene guanidine lactate is obtained from a polyhexamethylene guanidine phosphate. This reaction cannot been seen as a reaction with a chain extender.

10. Document D9 relates to fuel composition in which a alkyl-guanidino benzimidazole compound is used. Said disclosure is less relevant.

11. An inventive step may be recognised for the following reasons:

11.1 none of the available prior art documents would provide the skilled worker with an incentive to provide for polymers based upon prepolymers according to Formula (1),

11.2 also the object of the claimed invention (see page 1, lines 29-30), ie providing for a thermoplastic polymer and a process for its preparation, can be considered to be met. The examples show that the obtained polymeric products are useful in ink-jet compositions having reduced smearing by highlighter pens. This effect is by no means derivable from the available prior art.

12. The present application satisfies the criterion set forth in Article 33 (4) PCT because the subject matter of claims 1-13 is industrially applicable.

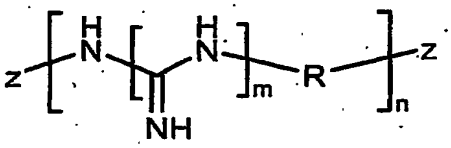
13. The feature "C_6-alkyene" used in claim 1 should read "C_6-alkylene" (Art. 6 PCT).

The description is not adapted to the limitations of the claims currently on file (Art. 6 PCT).

Claims

1. A process for forming a chain extended thermoplastic polymer which comprises reacting:

(i) a prepolymer comprising a salt of a compound of Formula (1):



Formula (1)

wherein:

each R independently is a C_6-alkyene group;
m is 1 or 2;
n is 1 to 100;
Z is a nucleophilic group; and

(ii) a chain extender having at least two groups able to react with the nucleophilic groups in (i).

2. A process according to claim 1 which is performed at a temperature of 0 to 110°C.

3. A process according to claim 1 wherein the nucleophilic group is thiol, hydroxy or an amino group.

4. A process according to any one of the preceding claims wherein the at least two groups able to react with the nucleophilic groups in (i) are selected from isocyanate, epoxide, halide and (meth)acrylate.

5. A process according to any one of the preceding claims wherein the nucleophilic end groups are amino groups, including an amino group in salt form, and the at least two groups able to react with the reactive groups in (i) are selected from isocyanate and epoxide.

6. A chain extended thermoplastic polymer obtained or obtainable by a process according to any one of the preceding claims.

7. A composition comprising:

(a) from 0.1 to 10 parts of a chain extended thermoplastic polymer according to claim 6;

(b) from 0 to 10 parts of binder;
(c) from 30 to 60 parts of water-soluble organic solvent; and
(d) from 35 to 80 parts water;
wherein all parts are by weight and the total number of parts (a) + (b) + (c) + (d) = 100.

8. An ink-jet printing process comprising the steps (a) and (b) in any order or simultaneously:
(a) applying an ink to a substrate by means of an ink-jet printer in a localised manner to form an image on the substrate; and
(b) applying to the substrate a fixing composition comprising a chain extended thermoplastic polymer according to claim 6, a liquid medium and optionally a binder.

9. A substrate printed with an image by means of the process according to claim 8 .

10. A recording sheet comprising a substrate, a chain extended thermoplastic polymer according to claim 6 and optionally a binder.

11. A set of liquids suitable for use in an ink-jet printer comprising:
(a) a fixing composition comprising:
(i) 0.01 to 50 parts, more preferably 0.1 to 30 and especially from 0.1 to 10 parts of a chain extended thermoplastic polymer according to claim 6;
(ii) 50 to 99.8, more preferably 60 to 80 parts of a liquid medium selected from water, one or more water-soluble organic solvents and a mixture of water and one or more water-soluble organic solvents; and
(iii) 0 to 50, preferably 0 to 40, more preferably from 0 to 10 parts of a binder;
wherein all parts are by weight and the total number of parts (i) + (ii) + (iii) = 100; and
(b) an ink comprising a colorant and a liquid medium.

12. An ink-jet printer cartridge comprising a plurality of chambers and a set of liquids, wherein the liquids are contained in individual chambers of the ink-jet printer cartridge and the set of liquids is as defined in claim 11.

13. An ink-jet printer cartridge comprising a plurality of chambers and a composition according to claim 7, wherein the composition is contained in the chamber of the ink-jet printer cartridge.